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WOO-SUP SHIN

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EXAMINER

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte WOO-SUP SHIN and JAE-GYU JEONG

Appeal 2009-010404
Application 09/039,438
Technology Center 1700

Decided: March 29, 2010

Before: CATHERINE Q. TIMM, JEFFREY T. SMITH, AND
JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

Opinion for the Board filed by CATHERINE Q. TIMM, *Administrative
Patent Judge*

Opinion Concurring filed by JEFFREY T. SMITH, *Administrative Patent
Judge*

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF CASE

Appellants appeal under 35 U.S.C. § 134 from the Examiner's decision to reject claims 1-26. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

Appellants' invention relates to an etching apparatus for etching glass substrates used to manufacture a liquid crystal display (LCD) in which most of the etching solution is recycled and which can automatically determine the end point of the etching process (Spec. 2, ll. 8-11 and 7, ll. 8-12).

Claims 1 and 10 are illustrative:

1. An etching apparatus for etching a glass substrate comprising:

a first tank including a first etchant;

an etch bath having a bubble plate, the glass substrate immersed in the first etchant and the etch bath connected to the first tank and receiving the first etchant, the etch bath containing a residual etchant including a diluted etchant and residue material after the glass substrate is etched with the first etchant, wherein a thickness of the glass substrate is uniformly reduced;

a second tank receiving the residual etchant from the etch bath and separating the diluted etchant from the residue material;

a connecting passage directly connecting the first and second tanks and directly transferring the separated diluted etchant from the second tank to the first tank;

an outlet pipe attached to the second tank, the outlet pipe discharging the residue material; and

a control unit controlling the first tank, the etch bath and the second tank, the control unit terminating the etching when a

temperature of the first etchant reaches a termination temperature.

10. An etching apparatus for etching a glass substrate with an etchant, comprising:

an etch bath receiving the substrate immersed into the etchant, the etch bath etching the glass substrate, wherein thickness of the glass substrate is uniformly reduced;

a temperature sensor installed in the etch bath, the temperature sensor measuring and monitoring a temperature of the etchant while the glass substrate is etched in the etch bath; and

a control unit controlling the etch bath, the control unit connected to the temperature sensor for receiving a signal indicating a temperature of the etchant to terminate the etching when the temperature of the etchant reaches a termination temperature.

The Examiner relies upon the following evidence:

<u>First Named Inventor</u>	<u>Document No.</u>	<u>Issue or Pub. Date</u>
Kovell ¹	US 3,532,568	Oct. 06, 1970
Jones	US 3,869,313	Mar. 04, 1975
Kanda	US 4,338,157	Jul. 06, 1982
Tittle	US 4,886,590	Dec. 12, 1989
Chung	US 5,000,795	Mar. 19, 1991
Allies	US 5,560,838	Oct. 01, 1996
Raymond A. Serway, <i>Physics for Scientists & Engineers with Modern Physics</i> 428 (2d ed. 1986).		

The Examiner maintains, and Appellants seek review of, the following rejections:

¹ The Examiner and Appellants refer to U.S. Patent No. 3,532,568 as “Schutt.” As the inventor name “Kovell” is listed at the top of the patent, we refer to this patent as “Kovell.”

1. The rejection of claims 1, 2, 7, 10, 11, 13, 14, 17-22, 25, and 26 under 35 U.S.C. § 103 as obvious over Kovell in view of Chung, Kanda, and Allies;
2. The rejection of claims 3-6, 8, 9, 12, 15, 23, and 24 under 35 U.S.C. § 103 as obvious over Kovell in view of Chung, Kanda, Allies, and Jones;
3. The rejection of claim 16 under 35 U.S.C. § 103 as obvious over Kovell in view of Chung, Kanda, Allies, and Tittle.

II. CLAIM 1

A. ISSUES ON APPEAL

Appellants first argue the patentability of claim 1. Appellants contend that “[Kovell] does not teach a [sic] an etch bath that etches a glass substrate to uniformly reduce the thickness of the glass substrate. Rather, [Kovell] is directed to etching copper from off of a substrate, specifically a printed circuit board” (Br. 15²). According to Appellants, “etching a material uniformly to reduce its thickness is completely counter to the goal of [Kovell]” and thus teaches away from the claimed invention (Br. 15; Reply Br. 5-6).

Appellants also contend that the combination of Kovell and Chung is improper because (a) Kovell is directed to etching copper from a circuit board with a ferric ion solution and Chung is directed towards cleaning semiconductor wafers, which are different processes, different problems and different fields, and which are also different from etching a glass substrate used for LCDs; (b) Chung’s bubble plate requires a gas supply which is not

² Citations to the Brief are to the Third Amended Brief filed October 31, 2008.

disclosed in Kovell, and, thus, a significant redesign of the system of Kovell would have been required to accommodate the bubble plate taught by Chung; (c) the Examiner has provided no evidence of the desirability of replacing etching zone 1 of Kovell with a bubble plate and tank of Chung; (d) that the particular etchant taught by Kovell, ferric ion solution, would not have required liquid mixing, as taught by Chung, and would not have been recognized by one of ordinary skill in the art as suitable for use in etching semiconductor wafers, as taught by Chung or glass substrates, as claimed (Br. 16; Reply Br. 6-7).

The first issues on appeal arising from the contentions of Appellants and the Examiner are: did the Examiner reversibly err in the rejection of claim 1 (a) based on the asserted lack of a teaching or suggestion of “etching a glass substrate . . . wherein a thickness of the glass substrate is uniformly reduced” as recited in claim 1, or (b) because the Examiner failed to provide sufficient reasoning as to why one of ordinary skill in the art would have combined the bubble plate and tank of Chung with the etching apparatus of Kovell?

B. FACTUAL FINDINGS

Appellants’ Specification indicates that methods and apparatuses for using acid solutions for etching glass substrates for LCDs are conventional, i.e., well known, in the art (Spec. 3, l. 14 to 4, l. 21; Fig. 1). Part of the conventional etch apparatus shown in Figure 1 includes an etch bath 20 with a bubble generating plate 27, which generates nitrogen bubbles for uniformly stirring the etchant and is installed at the bottom of the etch bath 20 (Spec. 4, ll. 6-11; Fig. 1).

Kovell teaches that, while particularly applicable to the etching of copper, the invention provides a method for etching any metal from a surface with a solution of a metallic ion by maintaining a substantial concentration of the metallic ion in the solution (Kovell, col. 1, ll. 58-71).

Kovell is relied upon by the Examiner to teach an apparatus in which the resulting liquid from a liquid etch is passed to a different tank where the solids are removed and the rinse liquid is treated and returned to a bulk storage tank to feed an etch bath (Ans. 3).

Kovell is silent as to the particular structure of etch zone 1, but states that the substrates (printed circuit boards) are “inserted” in etching zone 1, which “contains” an etchant (ferric ion in acidic solution) (Kovell, col. 2, ll. 22-26).

The Examiner recognized that Kovell did not teach an etch bath having a bubble plate, as recited in claim 1, and relies on the teachings of an etch bath and bubble plate taught by Chung (Ans. 4).

Chung teaches that it is well known that agitation “is required for removal of reacted contaminants from the wafers surface” (Chung, col. 1, ll. 29-30). Specifically, Chung teaches “a highly active bubbling condition within the tank which, together with the reagent chemical injection, provides sufficient agitation to improve significantly the removal of impurities from the surfaces of the wafers” (Chung, col. 1, l. 65 to col. 2, l. 2).

C. PRINCIPLES OF LAW

In interpreting the claim language, it must be determined whether functional and operational language in the preamble and in the body of the claim confers a structural limitation, *see, e.g., In re Echerd*, 471 F.2d 632, 634-35 (CCPA 1973); *In re Ludtke*, 441 F.2d 660, 663-64 (CCPA 1971); *In*

re Swinehart, 439 F.2d 210, 212-13 (CCPA 1971) (there is nothing intrinsically wrong in defining something by what it does rather than by what it is), or conveys a method of intended use concept. *See, e.g., In re Casey*, 370 F.2d 576, 579-80 (CCPA 1967); *In re Stencel*, 828 F.2d 751, 754-55 (Fed. Cir. 1987) (“Whether a [statement] . . . of intended purpose constitutes a limitation to the claims is, as has long been established, a matter to be determined on the facts of each case in view of the claimed invention as a whole.”).

Language in an apparatus or product claim directed to the function, operation, intent-of-use, and materials upon which the components of the structure work, that does not structurally limit the components or patentably differentiate the claimed apparatus or product from an otherwise identical prior art structure, will not support patentability. *See, e.g., In re Rishoi*, 197 F.2d 342, 344-45 (CCPA 1952); *In re Otto*, 312 F.2d 937, 939-40 (CCPA 1963); *In re Ludtke*, 441 F.2d 660, 663-64 (CCPA 1971); *In re Yanush*, 477 F.2d 958, 959 (CCPA 1973).

“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). The question to be asked is “whether the improvement is more than the predictable use of prior art elements according to their established functions.” *KSR*, 550 U.S. at 417.

“One of the ways in which a patent’s subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent’s claims.” *See KSR*, 550 U.S. at 419-420.

D. ANALYSIS

The Examiner contends that “the pending apparatus claims should not be limited by specific processes either recited in the pending claims or implied in the prior art” and that “in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art is capable of performing the intended use, then it meets the claim” (Ans. 10). According to the Examiner, “[Kovell’s] particular *process* of etching a different substrate, here copper, as identified by Applicant, does not distinguish Applicant’s claimed invention from that of the combined prior art” (Ans. 10-11). We agree with the Examiner’s reasoning.

Claim 1 is an apparatus claim. It recites an etching device having the following components: a first tank, an etch bath connected to the first tank and having a bubble plate, a second tank, a connecting passage directly connecting the first and second tanks, an outlet pipe attached to the second tank, and a control unit. The remaining language in the claim is functional or intent of use language that limits the claims only to the extent that those functional limitations result in patentable differences in structure. When the prior art structural components are capable of performing the associated tasks, it is reasonable to conclude that the claimed functions do not patentably distinguish the claimed structure from the prior art structure. For example, the first tank must be capable of including a first etchant. The etch bath must be capable of immersing a glass substrate, receiving a first etchant, and containing a residual etchant after a glass substrate has been etched to a uniform thickness.

While Kovell is silent as to the specific structure of etching zone 1, we find Kovell's disclosure that etching zone 1 "contains" an acidic solution and the printed circuit boards are "inserted" into etching zone 1 to be etched would have suggested to one of ordinary skill in the art the use of an etch bath. Thus, the structure of the etch bath recited in claim 1 would have been obvious to one of ordinary skill in the art.

While Kovell teaches a specific process for etching copper from a printed circuit board using a ferrous ion solution, the only reason that Appellants have asserted that Kovell's apparatus could not be used to etch a glass substrate is that the particular etchant would not have been suitable for use with a glass substrate. However, we are instructed to separate an apparatus from the material upon which the apparatus works to the extent such a limitation does not structurally alter the apparatus. *See Rishoi*, 197 F.2d at 345 ("[T]here is no patentable combination between a device and the material upon which it works."); *In re Young*, 75 F.2d 996, 998 (CCPA 1935) (Including the material being worked upon as an element in a claim directed to a device "may not lend patentability, since the claim is not otherwise allowable"). We find that given an appropriate etchant, the apparatus taught by Kovell would reasonably be capable of etching a glass substrate to a uniform thickness. In fact, Kovell expressly states that the teachings have applicability beyond the particular etchant, etched materials and substrates disclosed.

Accordingly, the Examiner did not err in rejecting claim 1 based on prior art that does not expressly teach etching glass substrates, since the apparatus taught would reasonably be capable of performing the claimed etch.

The Examiner has provided a reason why one of ordinary skill in the art would have used the bubble plate of Chung in the etching apparatus taught by Kovell, namely, because “[t]he bubble plate (17) transmits inert gas to create a bubbling condition within the tank (10) for sufficient agitation (col. 1, lines 60-68)” (Ans. 4). We find that the Examiner’s position is reasonable and that Appellants’ arguments do not sufficiently rebut the Examiner’s reasoning.

Chung teaches that the bubble plate assists in creating agitation that serves “to improve significantly the removal of impurities from the surfaces of the wafers.” (Chung, col. 1, l. 65 to col. 2, l. 2.) Appellants have acknowledged in the Specification that the use of a bubble plate for uniformly stirring etchant was conventionally known in the glass etching art.³ The evidence as a whole supports the Examiner’s conclusion that one of ordinary skill in the art would have recognized that such agitation would likewise improve etching in the Kovell process. Using the bubble plate would have been no more than the predictable use of the known the bubble plate according to its established function. *See KSR*, 550 U.S. at 417.

Appellants’ arguments about the purposes of using the apparatus of Kovell and Chung are not persuasive. We agree with the Examiner that both Kovell and Chung are related to devices for electronics manufacturing,

³ *See Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1570 (Fed. Cir. 1988) (“A statement in a patent that something is in the prior art is binding on the applicant and patentee for determinations of anticipation and obviousness.”); *In re Nomiya*, 509 F.2d 566, 571 n.5 (CCPA 1975) (It is a “basic proposition that a statement by an applicant, whether in the application or in other papers submitted during prosecution, that certain matter is ‘prior art’ to him, is an admission that that matter is prior art for all purposes.”).

particularly for the removal of undesirable material from the surface of a substrate, and that the structure taught by the references, essentially a tank, could be interchangeably used for etching or cleaning depending upon the particular materials being used and result desired.

We are cognizant of the fact that, to use the bubble plate, a gas line must be installed in the apparatus. The teachings of Chung provide sufficient evidence that it would have been within the skill of the ordinary artisan to have modified the etching apparatus of Kovell to include a gas supply line for the bubble plate as taught by Chung.

Appellants contend that independent claims 11, 21 and 26 are patentably distinguishable for the same reasons presented above for claim 1, and that dependent claims 2, 7, 13, 14, 17-19, and 25, which depend from independent claims 1 or 11, are also patentably distinguishable for the same reasons presented above for claim 1 (Br. 17).

Although rejected separately, Appellants also present no arguments with respect to dependent claims 3-6, 8, 9, 12, 15, 23 and 24 or dependent claim 16 above and beyond those presented with respect to claim 1 (Br. 19). We need not further address the other rejections as Appellants have presented no additional issues for our review over that which we have determined above.

III. CLAIM 10

A. ISSUES ON APPEAL

In addition to the arguments presented above, Appellants also present a separate argument with respect to claim 10. Specifically, Appellants contend that “[n]owhere in [Kovell] is there any suggestion of the desirability of controlling the etching process based on the temperature of

the etchant, because [Kovell] is directed to an etching solution and because the temperature of the reaction is irrelevant to the etching process” and that “[n]owhere in Kanda is there any disclosure or suggestion of determining a termination temperature, much less terminating the etching process once the termination temperature has been reached” (Br. 18; Reply Br. 9).

Further issues on appeal arising from the contentions of Appellants and the Examiner are: did the Examiner reversibly err in the rejection of claim 10 (a) based on the asserted lack of a teaching or suggestion of “receiving a signal indicating a temperature of the etchant to terminate the etching when the temperature of the etchant reaches a termination temperature” as recited in claim 10, or (b) because the Examiner failed to provide sufficient reasoning as to why one of ordinary skill in the art would have combined the thermocouple and controller of Kanda with the etching apparatus of Kovell?

B. FACTUAL FINDINGS

Kovell teaches that, while particularly applicable to the etching of copper, the invention provides a method for etching any metal from a surface with a solution of a metallic ion by maintaining a substantial concentration of the metallic ion in the solution (Kovell, col. 1, ll. 58-71).

Kanda teaches an etching apparatus having an etch bath, with a thermocouple disposed in the etch bath and connected to a “processing unit provided with a computing and controlling capacity” (Kanda, col. 9, ll. 12-27; Fig. 10).

Kanda teaches that the temperature of the etching solution is sensed by the thermocouple and put into the processing unit as a digital signal at various time intervals (Kanda, col. 9, ll. 53-59).

Kanda teaches that a relationship between etch rate (etching thickness per unit time) and temperature can be determined by experiments, by which a desired amount of etch can be calculated based on the temperature and time (Kanda, col. 9, l. 60 to col. 10, l. 29). The processing unit uses the temperature measurement from the temperature sensor and terminates the etch at the appropriate time (Kanda, col. 10, ll. 30-39).

C. PRINCIPLES OF LAW

The principles of law discussed above are equally relevant to the issues presented above with respect to claim 10.

D. ANALYSIS

We disagree with Appellants' contention that "[n]owhere in Kanda is there any disclosure or suggestion of determining a termination temperature, much less terminating the etching process once the termination temperature has been reached" (Br. 18; Reply Br. 9). As discussed in the Fact Finding section above, we find the teachings of Kanda suggest just such a process step.

The Examiner has provided a reason why one of ordinary skill in the art would have used the thermocouple and processing unit of Kanda in the etching apparatus taught by Kovell, namely, "to detect the termination of etching appropriately and precisely" (Ans. 5). We find that Examiner's position is reasonable and that Appellants' arguments do not sufficiently rebut the Examiner's reasoning. Accordingly, the Examiner has provided sufficient reasoning as to why one of ordinary skill in the art would have combined the thermocouple and processing unit of Kanda with the etching apparatus of Kovell.

Specifically, Appellants' contend that "the temperature of the reaction is irrelevant to the etching process" of Kovell (Reply Br. 9). We have discussed above that Kovell teaches that the apparatus may be suitable for etching metals from other surfaces using other etchants. The teachings of Kanda are evidence that, under certain etching circumstances such as etching aluminum from a semiconductor wafer, one of ordinary skill in the art may desire a temperature sensor and a processing unit to monitor the etching process and resultant thickness of the etched surface and to automatically stop the etch at a desired point. Thus, there existed at the time of invention a known problem (need for automatically monitoring and stopping and etch) for which there was an obvious solution encompassed by the claims (temperature sensor and control unit). Using Kanda's thermocouple and programmable processing unit in the apparatus of Kovell would have been no more than the predictable use of known components according to their established function. *See KSR*, 550 U.S. at 417.

Moreover, claim 10 does not require the recirculation system recited in claim 1, thus the teaching of Figure 10 of Kanda alone satisfy the requirements of claim 10. Kanda has all required components recited in claim 10: an etch bath, a temperature sensor, and a control unit. Although Kanda teaches a specific process for etching aluminum from a semiconductor wafer using a phosphoric acid solution, the material within the apparatus can only be considered to the extent such a limitation structurally alters the apparatus. *See Rishoi*, 197 F.2d at 345; *Young*, 75 F.2d at 998. Given an appropriate etchant, the apparatus taught by Figure 10 of Kanda would reasonably be capable of etching a glass substrate to a uniform thickness. Therefore, the claimed apparatus has not been shown to be

patentably distinguishable in structure from the structures suggested by the prior art.

Appellants contend that independent claims 20 and 22 are patentably distinguishable for the same reasons presented above for claim 10 (Br. 18).

IV. CONCLUSION

On the record before us⁴ and for the reasons discussed above, we sustain the rejections maintained by the Examiner.

⁴Only those arguments actually made by Appellants have been considered in this decision. Arguments which Appellants could have made but chose not to make have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2008).

SMITH, *Administrative Patent Judge*, concurring in result.

I concur with the majority's disposition of the rejections in this application.

Claims 1 and 10 are directed to an apparatus. Appellants' principle arguments are directed to the utility of the apparatus and not to the structure of the apparatus. "[A]pparatus claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch & Lomb, Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990). Therefore, the patentability of an apparatus claim depends on the claimed structure, not on the use or purpose of that structure, *Catalina Marketing Int'l Inc. v. Coolsavings.com Inc.*, 289 F.3d 801, 809 (Fed. Cir. 2002).

Appellants' arguments regarding the absence of a bubble generating plate in the apparatus of Kovell is not persuasive. Appellants acknowledge that in an etching apparatus it is conventional to include a bubble generating plate that functions to uniformly stir the etchant in the bottom of the etchant bath. (Spec. 4). Having acknowledged that certain claimed elements are taught by the prior art, Appellants cannot now defeat an obviousness rejection by asserting that the cited references fail to teach or suggest these elements. *See Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1570 (Fed. Cir. 1988)

V. DECISION

We affirm the Examiner's decision.

VI. TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2009).

AFFIRMED

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